#### Memorandum

To:

ALL DISTRICT/REGION DIRECTORS ALL DISTRICT/REGION DIVISION CHIEFS ALL PROGRAM/PROJECT MANAGEMENT ALL CONSTRUCTION MANAGEMENT

ALL DESIGN MANAGEMENT

Date:

July 31, 1997

File No.:

From:

DEPARTMENT OF TRANSPORTATION

DESIGN AND LOCAL PROGRAMS

MAIL STATION #28

Subject:

Constructability Reviews

Last December the "PS&E/Constructability Team", which was jointly sponsored by Design & Local Programs, the Construction Program and included representatives from the Districts, ESC and FHWA, recommended several process improvements. These recommendations are aimed at improving overall constructability in an effort to reduce contract change orders and delay claims. One of the Team's more significant recommendations calls for the implementation of a formal Constructability Review Process for all major capital outlay projects. The details of this process are outlined on Attachment A.

The Team is currently working with District 8 to implement the use of a formal Constructability Review Process, on a pilot basis, for a number of projects of varying size and type. District 12 has been successfully using a version of the Constructability Review Process since 1991, and the State of Washington is actively working to implement Constructability Review Processes within their organization.

It appears that the value of this tool in preventing construction problems outweighs the effort required to implement therefore Districts and Regions shall utilize this process for all projects with an estimated escalated construction cost of \$25 million or more. These will typically be the more complex projects requiring a comprehensive "Level 1" review, as described on Attachment A. Exceptions to conducting constructability reviews are to be approved by the District or Region Director. Projects already in the "pipeline" should be reviewed at the next Constructability Review stage.

When conducting Constructability Reviews, the Headquarters Project Development Coordinator and Construction Reviewer may be helpful on the review team.

All District/Region Directors
All District/Region Division Chiefs
All Program/Project Management
All Construction Management
All Design Management
July 31, 1997
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If you have any questions regarding the Constructability Review Process or need help with implementation, please call Jim De Luca, of my staff, at Calnet 453-4067. If you have any suggestions for improvements or changes needed to make this tool more useful, please advise Jim or the Project Development Coordinator assigned to your District.

ROBERT L. BUCKLEY

Program Manager

Design and Local Programs

#### Attachment

JDeLuca:dlt bcc: BColeman BGauger JDeLuca OPPD File

# ATTACHMENT A Constructability Review Process

#### **Process Overview:**

The formal Constructability Review Process is an iterative, multidisciplinary review at defined stages of the project development process. It is appropriate to vary the number of reviews based on the size and complexity of the individual project. A "Level 1" Constructability Review, which includes reviews at the Project Initiation Document (PID) stage and 30%, 60%, and 95% design stages is appropriate for the following types of projects:

- Large, complex roadway/facility improvements (including new construction, widening, or realignment projects with significant staging and traffic handling requirements).
- Complex interchange construction or modifications.
- Large structure projects with complex or very high cost features.
- Large rehabilitation projects which include widening, major replacements of structures/drainage features, or significant utility involvement.

A "Level 2" Constructability Review which includes a PID stage and 30% and 95% design reviews is appropriate for:

- Less complex roadway/facility projects (including widening projects with minimal staging/traffic handling requirements).
- Less complex structure or interchange projects.
- Most rehabilitation projects which include structure rehabilitation, minor widening, drainage, or safety improvements.

A "Level 3" Constructability Review which includes a PID stage and 95% design review is appropriate for other simple projects such as:

- Capital Preventative Maintenance (CAPM) overlay projects.
- Most non-complex Soundwall projects.

The PID review involves the review of the Draft: PSR, PSSR, or other initiation document, prior to programming of the project. It is a "fatal flaw"-type review to assure that all alternatives are constructable based on the available level of detail. It includes a review of the proposed project workplan and schedule.

The 30% design review generally takes place after "project approval" (approval of the Final Environmental Document and/or Project Report Project) at the "Geometric Base Map" stage. It includes the review of traffic control, staging and right-of-way requirements. Available hydraulics and/or geotechnical information is included in this review as are any environmental restrictions or mitigation requirements. The review addresses any design modifications since the PID review.

While there is no formal constructability review step proposed during the Environmental Document (ED) stage, it would be prudent to consult with the Constructability Review team members before finalizing the ED. This is particularly important during consultation with environmental permitting agencies which may establish construction windows or place specific mitigation requirements on the project.

The 60% design review is a more detailed review of final project geometrics, completed earthwork/grading plans, drainage layout and preliminary quantity calculations. Final right-of-way requirements are reviewed as are traffic control, construction staging, and permitting agency commitments. The review addresses any design modifications or schedule or resource changes since the previous review.

The 95% design review incorporates the project Safety Reviews and builds upon prior reviews. It includes a check of final quantities, special provisions (including number of contract working days) and project cost estimate.

Each level Constructability Review is conducted such that project information (reports, plans, etc.) are distributed to each team member at least two weeks prior to the Constructability Review meeting. Team members conduct a detailed independent review, using a checklist appropriate for their functional area, and compile comments which are brought to the Constructability Review meeting. These checklists are signed by the individual Functional Managers, for their respective Division Chiefs, to assure accountability. (Attached are functional checklists to assist each functional unit in completing their reviews).

All comments are discussed at the Constructability Review meeting, which may take up to four hours for each Constructability Review level. The goal is to resolve all comments during the meeting. Any comments which cannot be resolved during the meeting are assigned to a review team member who is responsible for prompt follow up by a specific date. The Project Engineer and/or Project Manager has the overall responsibility to assure that all comments are adequately addressed, as described in "Implementation Responsibilities", below.

#### Resources:

To assure that functional unit staff are available to conduct these constructability reviews, the Project Manger negotiates with each Functional Manager at the PID stage and includes sufficient time and resources in the Project Workplan. This means that more resources may need expended during the early stages of the project development process. However the resources required to conduct the Constructability Reviews should be more than offset by the savings in capital support resource which are currently going towards negotiating Contract Change Orders (CCOs) and resolving claims.

#### Implementation Responsibilities:

The Project Manager is responsible for selecting the appropriate Constructability Review level, assuring that sufficient time and resources are allocated for the Constructability Review in the Project Workplan and that the Constructability Reviews take place at the established times. The Project Engineer is responsible for distributing the project information to the appropriate functional units for each Constructability Review level. The Project Engineer, in conjunction with the Project Manager, schedules and coordinates the Constructability Review meetings. The Project Manager also assures that all comments are adequately addressed in the project. If a comment is not addressed, the Project Engineer, with the concurrence of the Project Manager, responds to the functional unit which generated the comment, explaining why it was not addressed.

Functional Managers involved in the project are responsible for actively participating in the Constructability Review Process and for providing thorough timely comments. Typical functional involvement at each Constructability Review level include representatives from: Design, Construction, Environmental, Maintenance, Traffic, Right of Way, and Structures. At the early Constructability Review levels, it may be appropriate to include regulatory (permitting) agencies or local agency staff. Later Constructability Review levels may include representatives from Materials/Geotechnical (ESC), Hydraulics or Permits. Headquarters representation for each Constructability Review should include the Project Development Coordinator and Construction Reviewer, particularly for the larger, more complex "Level 1" projects.

Project Information: - CoRte	. <b>-</b> KP:	District/EA:			
Reviewed By:		Functional Unit: <b>DESIC</b>			
I certify that a thorough and co	omplete constructa	bility review has been perfor	med by my	staff:	
				- > 511	
Signature of Functional Manag		Date		E Mile	
Key	y Constructability	Issues	30%	60%	95%
Traffic Management Plan has been de	eveloped, if require	ed	X	X	
Preliminary structures studies perfor	med		X		
Preliminary materials investigation co	onducted		X	X	
Drainage mitigation measures propos	sed		X	X	
Development of workable construction	on staging plans co	omplete and shown on plans	X	X	
Specifications for traffic handling & 1	ane closures are in	cluded			X
Conflicts with on-going projects iden	tified		X		
Construction easements adequate			X	X	X
Identification and avoidance of section	on 4(f) properties		X		
All necessary permits to construct id	entified/acquired		X	X	X
Adequate access for residents & busi		der construction	X	X	
Necessary construction details cover					X
Work shown on plans is adequately of	described in Std Sp	pecs or SSPs			X
Utility plans conform to Caltrans policy on high & low risk facilities					X
Hazardous Waste sites identified and			X	X	X
Proposed "work-arounds", if needed			X	X	X
Drainage interface with adjoining pro				X	
Consistency between roadway and s				X	X
Project Materials Report recommend					
Embankment foundations an		ates	X	X	
Slope Design			X	X	
Subsurface/groundwater con	trol		X	X	
Railroadinvolvementidentified			X	X	X
Impacts of construction windows rec	uired by environn	nental Resource Agencies	X	X	X
	<del></del>				

Previous suggestions/corrections addressed

Project Information: - C	CoRteKP:	District/EA:			
Reviewed By:	Date:	Functional Unit:	TRAFFIC		<u>/</u>
			TRAFFICE		
I certify that a thorough	and complete constr	uctability review has been pe	rformed by my	staff:	
Signature of Functional	Manager	Date	PS&	E Mile	
	Key Constructab	ility Issues	30%	60%	95%
Traffic Management Plan has	been developed, if re	quired	X	X	X
Development of workable cor			X	X	
Stage construction is adequate				X	X
Specifications for traffic handl		re included			X
Adequate access for residents			X	X	
Signing and pavement delinear			X	X	
Construction area signs				X	
Previous suggestions/corrections	ons addressed		X	X	X
				<u> </u>	

Project Information: - 0	CoRteKP:	District/EA:_			
Reviewed By:	Date:	District/EA:Functional Unit:	TRAFFIC DESIG		
			<b>ELECTRIC</b>		ESIGN.
I certify that a thorough	and complete constr	uctability review has been pe	rformed by my	staff:	
Signature of Functional	Manager	Date	PS&	E Mile	stone
	Key Constructab	ility Issues	30%	60%	95%
Construction staging covered	in sign plan		X	X	
All sign structures and founda	tions designed and ca	alculations submitted	X	X	
All roadside signs include siz	e and type of posts			X	
Staging plans show how traffi shows a striping/marker plan.		each stage and each traffic st	age	X	:
Signing and pavement delinea			X	X	X
Construction area signs				X	X
Power source identified for pe	ermanent & temporar	y electrical systems		X	X
Previous suggestions/corrections	ons addressed		X	X	X
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Project Information: - CoRteKP:District/EA:			
Reviewed By:Date:Functional Unit: C	ONSTRU		<u>N</u>
I certify that a thorough and complete constructability review has been perfor	med by my	staff:	
	DOO		
Signature of Functional Manager Date	<del></del>	E Mile	<del>,                                    </del>
Key Constructability Issues	30%	60%	95%
Any conflicts with on-going contracts/projects.		X	X
All necessary permits to construct/enter identified and acquired.	X	X	X
Cross sections are developed as required.		X	
Typical cross sections includes existing conditions.	X	X	
Number of working days sufficient for the type of work.			X
Liquidated damages calculated per project's complexity.			X
Lane closure charts' times and days are realistic.		X	X
Detours, Traffic Handling plans and stage construction plans are included as require	d.	X	X
Utility Plans complete and high risk utilities identified and located on plans.	X	X	X
Construction Details are complete and buildable.		X	X
Log of Test Borings included for all retaining and soundwall projects.			X
Drainage profiles included as required. Alternative pipe culvert table included.		X	X
Railroad involvement on plans resolved.		X	X
Adequate access as required for residents/business in areas under construction is		X	X
obtained.			
Impacts of construction windows required by environmental Resource Agencies	X	X	X
Previous suggestions/corrections addressed	X	X	X

Project Information: - CoRteKP:	_District/EA:			
Reviewed By:Date:Functi				NGR.
I certify that a thorough and complete constructability revie	rw has been performed	by my	staff:	
Signature of Functional Manager Date		PS&	E Mile	stone
Key Constructability Issues		30%	60%	95%
All items of work shown on Plans specified in SSPs and	match pay items			X
in BEES. Description and unit of measure are consistent	in PS&E.			
Railroad involvement on plans resolved.			X	X
Cross sections are developed as required.				X
Standard Plans Lists are complete and accurate.				X
Typical cross sections includes existing conditions.		X	X	X
First Layout sheet contains legends, symbols abbreviation	ons not shown on			X
Standard Plans. All necessary exist facilities shown in d	ropout.			
Construction Details are complete.				X
Drainage profiles included as required. Alternative pipe	culvert table			X
included.				
Detours, Traffic Handling plans and stage construction plans are included			X	X
as required.				
Summary of Quantities are tabulated & summarized cor	rectly.			X
Utility Plans complete & high risk utilities identified & located on plans.			X	X
Log of Test Borings included for all retaining and soundy	vall projects.			X
Number of working days sufficient for the type of work.				X
Liquidated damages calculated per project's complexity.				X
Lane closure charts are included.				X
SSPs specify all work to be done in Plans & contract pay	items in BEES.			X
All SSPs have necessary measurement and payment cla	uses			X
All SSPs related to obstructions (including high risk faci	lities) are incl.			X
Railroad clauses provided.				X
All permits are obtained & requirements needed are incops&E.	orporated in the	X	X	X
Supplemental Funds for Maintain Traffic included.				X
Environmentally Sensitive Areas (ESAs) are identified of included in SSPs.	on plans and	X	X	X
Storm Water Pollution Prevention Plan (SWPPP) issues addresse	:d		X	X
Previous suggestions/corrections addressed		X	X	X

Project Information:	- CoRteKP:	District/EA	٠:	_	
Reviewed By:	Date:	District/EA	<b>LANDSCA</b>	PE AF	RCH.
I certify that a thorou	gh and complete constr	uctability review has been p	performed by my	staff:	
Signature of Function	al Manager	Date	PS&	E Mile	stone
	Key Constructabi	ility Issues	30%	60%	95%
Mitigation or replacement p	lanting during construc	tion addressed		X	X
Existing as-built irrigation s			X		L
Power locations for irrigation	on timers have been iden	tified		X	
Verify existence of utility c			X		
Water supply line (through	bridges) has been incor	porated in bridge plans		X	
Cost break-down included					X
Environmentally Sensitive	Areas (ESAs) identified	on plans	X	X	X
Previous suggestions/correct	tions addressed		X	X	X
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Project Information: - CoRtek	te: District/EA:  Functional Unit:			
Reviewed By:Da	te: Functional Unit:	MATLS &		ECH.
I certify that a thorough and com	plete constructability review has been perfo	rmed by my	staff:	
Signature of Functional Manager	Date	PS&	E Mile	stone
Key (	Constructability Issues	30%	60%	95%
Test methods comply with Calif. Test	Methods or ASTM or AASHTO alternative	ves		X
Project Materials Report recommendation				
Structural Section Design		X	X	
Slope Design		X	X	
Embankment foundations & set	tlement estimates	X	X	
Subsurface/ground water contro	1	X	X	
Earthwork		X	X	
Seismic Design Criteria		X	X	
Geotechnical Baseline Info (if appropri	ate)	X	X	
Available material sources identified			X	
Materials handout provided (when app	licable)			X
Previous suggestions/corrections address	ssed	X	X	X
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Project Information: - CoRteReviewed By:Da	ate:	Functional Unit:	ENVIRON		AL
I certify that a thorough and com	plete constructabl	ility review has been pe	erformed by my	staff:	
Signature of Functional Manager	•	Date	PS&	E Mile	stone
	Constructability I	ssues	30%	60%	95%
Is a environmental reevaluation require	d or needed		X	X	X
Do soundwall designs conform to envir	ronmental requirer	nents	X	X	
Are design noise levels affected by mine			X	X	X
All permit requirements determined an			X	X	X
Do plans and specifications include noi		sures during constructi	on	X	X
Are all required mitigation measures in				X	X
Are all permit requirements satisfied ar			е	X	X
Is there a list of recommendations and					X
including schedules and commitments	provided by the pe	ermitting agency			
Are Environmentally Sensitive Areas (				X	X
Mitigation monitoring program establis	shed and feasible		X		X
Is there a temporary erosion and sedim	nentation control p	olan		X	
Environmental construction windows i			X	X	X
					<u> </u>
Previous suggestions/corrections addre	essed		X	X	X

	CoRteKP:				_
Reviewed By:	Date:	Functional Unit:	MAINTEN		,
I certify that a thoroug	gh and complete constr	uctability review has been per	formed by my	staff:	
Signature of Functions	al Manager	- Date	PS&	E Mile	estone
Signature of Functiona	Key Constructab		30%		
				·	X
Access for maintenance pers	sonnel (trash, landscape	e, electrical, structures & park	ing)	X	X
Proposed landscaping provide	des erosion, weed & in	sect control & is fast growing		X	<del></del>
Provisions for maintenance of	cleanouts for drainage			X	X
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Previous suggestions/correct	tions addressed		X	X	X
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Project Information: - CoRteKP:	District/EA:			
Reviewed By:Date:	Functional Unit:	HAZARDO	OUS W	ASTE
I certify that a thorough and complete construc	tability review has been per	formed by my	staff:	
Signature of Functional Manager	Date	PS&	E Mile	stone
Key Constructabilit	y Issues	30%	60%	95%
Hazardous waste design actions consistent with Distr	ict's Haz. Waste Procedur	es X		
Initial Site Assessment (ISA) conducted on all proper	ties involved in the project	X		
Extent and nature of hazardous waste sites identified	by RI/FS	X		
Hazardous waste mitigation prior to construction incl	udes documentation to ens	ure X	X	
mitigation completion				
Hazardous waste mitigation during construction (by	exception only):	X	X	X
<ul> <li>Appropriate plans and specifications being</li> </ul>	developed	X	X	X
<ul> <li>PS&amp;E adequate to being biddable and unde</li> </ul>	rstandable by contractor	X	X	X
HQ Deputy Director for Project Developm	nent approval	X	X	X
<ul> <li>Proposed work-arounds, if needed, are clea</li> </ul>	• •	X	X	X
Appropriate permits and plans are handled	•	X	X	X
- Appropriate permits and praise are managed		X	X	X
Construction Hazardous Waste Contingency Plan			X	
Hazardous waste mitigation completed prior to PS&I	E submittal			X
Previous suggestions/corrections addressed		X	X	X

Project Information: - CoRteKP:District/EA:			
Reviewed By: Date: Functional Unit: HYD	RAUL		
I certify that a thorough and complete constructability review has been performed	d by my	staff:	
	700		
Signature of Functional Manager Date		E Mile	
Key Constructability Issues	30%	60%	95%
Approved preliminary drainage report	X		
Approved vertical and horizontal alignment	X		
Typical cross-section	X		
Preliminary drainage plans	X		
Maintainable facility with sufficient right-of-way and/or drainage easements	X		
Utilization of correct erosion factors for slope soil loss, stream aggradation/degradation	X		
outlet velocities			
Subsurface conditions studied adequately including groundwater control	X		
Flow diversion/connection approved by appropriate agencies		X	
Drainage for construction staging		X	
Drainage interface with adjoining projects or future projects		X	
Drainage plans, profiles and details are sufficient including special designs for large		X	
underground structures			
Grading plans	<u> </u>	X	
Soundwall and/or retaining wall drainage plans adequate	<u> </u>	X	
Bridge and/or pumping plant plans included		X	
Erosion Control plans complete and sufficient		X	
Pipe jacking method appropriate for given site conditions		X	
Materials report recommendations for backfilling adequate		X	
Channel lining adequate for conditions and availability of source		X	
Drainage is consistent with roadway and structure plans		X	X
Drainage quantity estimates accurate		X	X
Drainage specifications adequate			X
All required permits obtained including cooperative agreements			X
Floodplan issues resolve (ie, impact on base flood elevation)		<u></u>	X
Computability of project with future projects			X
Previous suggestions/corrections addressed	X	X	X

Project Information: - CoRteKP:	District/EA:			
Reviewed By: Date:		YDROLO		
I certify that a thorough and complete constructabilit	y review has been perfori	ned by my	staff:	
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Digitation of 1 and 1 statements	Date		E Mile	
Key Constructability Issu	ies	30%	60%	95%
Ultimate drainage basin design protects private property an	d freeway against floodii	ıg	X	
Minimum diversion of natural stream flow			X	
SAG points of depressed sections of alignment designed for	r 50-year storm		X	
Pumping plants designed according to Pumping Plant Design	gn Manual		X	
Upstream and downstream affect on run-off is addressed			X	
Are water quality (surface groundwater) impacts anticipate	d and mitigated	X	X	
(detention and/or retention ponds required)				
Are dewatering systems needed		X	X	
Previous suggestions/corrections addressed		X	X	X
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Project Information: - CoRteKP:District/EA:				
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I certify that a thorough and complete constructability review has been performed	d by my	staff:		
Date Date	DC &	PS&E Milestone		
Signature of Functional Manager Date		60%		
Key Constructability Issues	30% X	00%	95%	
Right-of-way boundaries include all highway facilities				
All construction and footing easements are identified				
All appraisals, acquisitions and relocation assistance procedures/processes				
are conducted in accordance with Federal/State regulations	<b></b>			
All high risk utility relocations identified	X			
All utilities have Joint Use or Common Use agreements		X		
Railroad agreements contain necessary language with regard to insurance, maintenance, construction, costs and clearance issues		X		
Environmental mitigation agreements cover park and ride facilities or other mitigation	<del>                                     </del>	X		
		<b>A</b>		
issues contained in the Environmental Impact Report		X		
All easements are reviewed before granting	<del>                                     </del>	X		
Schedule of all utility relocations required prior to start of construction is identified			X	
All hazardous waste procedures are satisfactorily completed and necessary clearance			^	
documents obtained	<del> </del>		X	
All right-of-way has been certified			X	
Previous suggestions/corrections addressed	X	X	<u> </u>	
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Project Information: - CoRteKP:District/E. Reviewed By:Date:Functional Unit:	<b>SURVEYS</b>		
I certify that a thorough and complete constructability review has been	performed by my	staff:	
Signature of Functional Manager Date	PS&	E Mile	stone
Key Constructability Issues	30%	60%	95%
Horizontal control Information: IE: NAD 27 or 83 monuments used for control	trol, Calif. X	X	X
Coord. System			
Vertical control: Datum used and benches for vertical control	X	X	X
Bearings, stationing, curve information (alignment)	X	X	X
All dimensions		X	X
Drainage plans and profiles		ļ	X
Determine that the plans are stakeable from a construction survey point of v	iew		X
Right-of-way summary traverses		<u> </u>	X
Sub grade & finished grade slope stake listings			X
Cross sections - w/finished and subgrade		<del> </del>	X
Previous suggestions/corrections addressed	X	X	X
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Project Informa	tion: - CoRteKP:	District/EA:Functional Unit:			
Reviewed By: _	Date:	Functional Unit:			
I certify that a th	norough and complete cons	tructability review has been performed	d by my	staff:	
Signature of Fur	nctional Manager	Date			
PROJECT INITIATION DOCUMENT (PID)			Issue Addressed		
	Key Constructa		Yes No		N/A
Alternatives identified	staging for each alternative				
Preliminary Environm	ental Evaluation prepared f	for each feasible alternative (Impacts			
to and of construction	)				
	Assessments (ISA) for haz				
Preliminary Traffic M	anagement Plans (TMP) de	eveloped, if required			
Preliminary structures	studies performed -Advan	ce Planning Study (APS)			
Preliminary materials	investigation conducted				
All permits identified	(impacts to construction so	hedule and methods)		<u> </u>	
	(impacts to staging and tem		<u> </u>		
	coordination with highway				
Impacts on utilities (c	oordination with highway	construction)			
	s if required (Environmenta				
Construction window					
	required with PS&E/contra	act plans?			